REMARKS

An indication of allowability of claims 9-11 was noted with appreciation.

Claims 2-8, 10-14 are currently pending in the application. By this amendment, claims 2-3, 5 and 8 were amended incorporate allowable subject matter. The feature of allowable claim 9 is incorporated into claim 3, and claim 9 is canceled. No new matter is added. Reconsideration of the rejected claims in view of the above amendments and the following remarks is respectfully requested.

Claims 2-6, 12-14 were rejected under 35 U.S.C. §102(e) as being anticipated by Wen et al. (U.S. Patent 6,046,822) and claims 7 and 8 were rejected under 35 U.S.C. §103(a) as being unpatentable over the same reference in view of Mizoguchi et al. (U.S. Patent 5,438,437) and Sachs et al. (U.S. Patent 5,807,437) respectively. These rejections are respectfully traversed based on the above amendments and the following discussion.

According to amended claim 2, the waveform data is updated by replacing the waveform data with a different waveform data stored in a memory. None of the references cited discloses this feature.

The feature of allowable claim 9 is incorporated into claim 3. According to amended claim 5, although a driving pulse includes a plurality of sub-pulses, each ejection element ejects only a single ink droplet in response to the driving pulse, but does not eject a plurality of ink droplets. As shown in Figure 12A of the present application, controlling the split time can change the ink amount without greatly changing the ejection speed. (If a pulse width of the driving pulse is changed to change the ejection amount, the ejection speed greatly changes as shown in Figure 11.) This feature is not disclosed in Wen.

The ink jet recording device according to claim 6 includes a smoothing unit that smoothes a driving signal that is applied to the piezoelectric element. Because a device of Mizoguchi is a laser printer, the device does not include a piezoelectric element, and thus there is no means for smoothing a signal that is applied to the piezoelectric element. Although Mizoguchi discloses a smoothing processor, this smoothing processor is for smoothing a printed image by controlling the size and/or location of dot. The smoothing processor of Mizoguchi therefore differs from the smoothing element of the claimed invention.

According to claim 12, there is provided a leveling unit that levels generated timings of the driving pulses. This prevents a large number of pulses from being generated at the same time, thereby preventing interference among the nozzles. The Examiner states that this feature is disclosed in Wen, referring to column 5, lines 38-51. However, this section of Wen says that ink droplet landing time is adjusted to compensate the placement variablility. Thus, the Examiner's rejection is not supported by the teachings of Wen.

Claim 13 corresponds to the fourth embodiment of the present invention. According to claim13, original time resolution is changed to a predetermined time resolution. The original time resolution corresponds to 1/16 of a pixel of the embodiment, and the predetermined time resolution corresponds to a resolution defined by the clock 2109 of the embodiment. The Examiner rejects claim 13 by referring to Wen, column 5, lines 38-51, which says that ink droplet landing time is adjusted to compensate the placement variablility. This is misinterpretation of the meaning of time resolution.

In the claimed invention, the waveform is generated by using digital data. Definition of digital is "quantitizatio" and "sampling". "Quantitization" means voltage is set into discrete values, and fineness of the discrete is called voltage resolution. For example, if voltage can be set 40.5V, 41V, ..., then the voltage resolution is 0.5V. If voltage can be set to 40.1V, 40.2V, 40.3V,..., then the voltage resolution is 0.1V, which is finer than the resolution of 0.5V.

"Sampling"means that time sequence along which the voltage changes is set into discrete values, and the fineness of the discrete is called time resolution. If the timings for generating pulses are set in 0.1μs unit (0.1μs, 0.2μs , 0.3μs ,...), ejection timing is more accurately controlled compared with when the timings are set in 1 s unit (1μs, 2μs, 3μs, ...). The former is time resolution of 0.1μs, and the latter is the time resolution 1 μs.

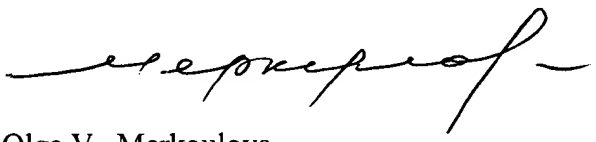
If the time resolution is set finer, then the ejection timing is controlled more precisely. However, at the same time problems occur in operation of the device, e.g., time required to transmit data increases.

According to the present invention, however, a resolution is changed to a resolution necessary for forming a pulse waveform with a desired accuracy only when the pulse waveform is formed. Therefore, a waveform can be formed with a desired preciseness without affecting any

other functions of the device.

In view of the foregoing amendments and remarks, Applicant submits that all of the claims as amended are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. The Examiner is invited to contact the undersigned at the telephone number listed below, if needed. Applicant hereby makes a written conditional petition for extension of time, if required. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041 (Whitham, Curtis & Christofferson, P.C.).

Respectfully submitted,



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